

oxygen (*Annals of Botany*, vol. x. p. 288), and I have since ascertained in several ways that the plant is nearly as greedy for oxygen as are many seedlings. A branch of *Chara* placed in the methylene blue and put in the dark, will decolorise the surrounding liquid in a few hours; but if the tube containing it be exposed to the action of bright daylight the colour soon returns when the plant is alive, owing to the evolution of oxygen consequent on its splitting up the carbon dioxide which has been evolved by it, and which has been accumulating in the water, during the plant's stay in darkness. (Of course it is hardly necessary to state that the carbon dioxide is not itself the cause of the loss of colour in the liquid.) The experiment can be repeated several times with the same *Chara* plant, and we have succeeded in keeping it alive (as proved by the continuance of the protoplasmic movement) for four days. Naturally if the experiment is performed in continuous daylight no decoloration is effected.

Many other plants fail to give such quick results; thus *Elodea* requires about two days in darkness to obtain the reaction. All the plants experimented on give a result much more quickly if they have previously been starved of oxygen. And this indicates that under these conditions, as also under those of the experiments above described, the oxygen is not directly utilised either by the protoplasm, or some of the normal combustible bodies present in the cell, but by some dissociation product formed during the metabolic activity of the protoplasm. Of course decoloration of the blue does not occur when the plants are exposed to the action of free oxygen; this element can then be obtained more cheaply than by reducing the aniline dye. But this is not the place in which to discuss the meaning of the reaction or the nature of the substance which primarily reduces the methylene blue. The facts have been arrived at during an investigation, which is still proceeding, into the respiratory processes of plants. The method here detailed is, however, so simple, and seems likely to prove useful to teachers and others as a demonstration-experiment, that it appeared worth while to make it generally known. J. B. FARMER.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—In connection with the extracts printed last week (p. 165) from the reports of the delegates of the University Museum, referring to the want of accommodation and equipment for research in certain branches of science, it may be worth while directing attention to the leading article in *Literature* of June 11, regretting that little original work is being done in the domain of letters. The opinion is expressed that the Royal Commission which sat on the Universities rather more than twenty years ago, "made Oxford and Cambridge much more effective places for teaching and examining than they had been before, while at the same time it helped to ruin them as places for study." The leader concludes with the words:—"Englishmen are by nature somewhat too much inclined to look for an immediate advantage; to bring all things to a common-sense, even a commercial, test; to distrust theory; to despise action for an abstract end. One of the functions of a University is to keep alive a higher faith by giving an example of thorough and devoted work done without a commercial object. Our Universities, as they are at present managed, do no such thing."

The research degree of Bachelor of Science was conferred upon Mr. A. E. Tutton in Congregation on June 16. Mr. Tutton is the first recipient of a degree for research in natural science or natural philosophy, the only other research degree yet conferred being for mathematical work. In order to qualify for the degree eight terms must be kept, and one or more original theses presented. Mr. Tutton presented two theses—one his paper on the crystallography of the selenates of potassium, rubidium and cesium, and the other on the new interference dilatometer exhibited by him at the recent conversazioni of the Royal Society. The B.Sc. research degree ranks with the B.C.L. immediately after the M.A. degree, and before the B.A. degree. It is hoped that, by requiring a high standard of qualification for the new degree, research will be encouraged, and the scientific work of the University will be increased in value and amount.

CAMBRIDGE.—Among the ten recipients of honorary degrees on June 15 were the Italian Ambassador (General Ferrero) and Mr. F. C. Penrose. General Ferrero early distinguished himself

in mathematics, and, after an active military career, he became connected with the military and geographical Institute of Florence, editing all its publications from 1873 to 1893, and being at its head from 1885 to 1894. He organised the general topographical and cadastral survey of Italy, which led to the publication of important maps of the country, in the preparation of which valuable aid was derived from photography. In 1883 General Ferrero was made a Member of the Accademia dei Lincei, and in 1892 a Senator of Italy. Since 1874 he has taken an important part in the International Commission for the measurement of the earth's surface, and in this respect (amongst others) he has a European reputation.

Mr. Penrose has not only made valuable contributions to archaeology, but also to astronomy, and his papers on the orientation of Greek temples exhibit the rare combination of archaeological and astronomical knowledge.

The following are the speeches delivered by the Public Orator, Dr. Sandys, in presenting General Ferrero and Mr. Penrose for the honorary degree of LL.D. and Litt.D. respectively:—

Olim in hoc ipso loco Italiae legatum belli et pacis artibus illustrem salutavimus; hodie eiusdem adiutorem atque adeo successorem insignem non minus libenter salutamus. In Academia Taurinensi scientia mathematica excultus, et rei militaris et geographiae studiis deditus, Italiae toti accurate dimetiendae et describendae summa cum laude est praepositus. Huic imprimis debemus regionum Italiae tabulas depictas, partim lucis ipsius auxilio in lucem emissas; hunc non modo Linceorum Academia Romana sociis suis, sed etiam Italia tota senatoribus suis merito adscriptis; huius fama ultra patriae fines a se ipso tam diligenter descriptis etiam in alias Europae partes latissime diffusa est. Asiae regiones pulcherrimae (Vergilio si credimus) Italiae cum laudibus certare nequeunt; Europae gentes maximae Italiae legatum insignem certatim laudant. Belli certe et pacis artes feliciter consociatae sunt Italiae in legato illustri, ANNIBALE FERRERO.

Hodie reducem salutamus alumnus nostrum qui abhinc annos fere septem et quinquaginta Thamesis inter undas e certamine nautico cum Oxoniensibus commissio semel tantum victus, plus quam semel victor evasit. Olim Academiae nomine in Italiam et Graeciam missus, de Atheniensium templis opus egregium edidit, in quo Parthenonis et columnas et epistylum columnis impositum lineis non rectis sed leviter curvatis contineri primus omnium ostendit, et ordinis Dorici maiestatem artificio tam minuto adjuvari demonstravit. Idem nuper de templis Graecis ad stellas quasdam orientes conversis ingeniose disputavit. Illud vero felicitatis conspicuae documentum Nestori nostro contigit, quod et Athenis et Londinii architecturae studiis diu deditus, non modo Sancti Pauli ecclesiae cathedralis in culmine sed etiam Iovis Olympii columnarum in fastigio solus omnium mortalium constitit. Viro ad tantam altitudinem evecto non sine reverentia quadam in hoc templo honoris lauream nostram laeti decernimus.

Duco ad vos Collegii Magdalenae socium, Britannorum Scholae Archaeologicae Atheniensi et Regio Architectorum Instituto nuper praepositum, FRANCISCUM CRANMER PENROSE.

THE vote of 8,520,175*l.* for public elementary education in England and Wales, was passed by the Committee of Supply of the House of Commons on Friday. To this sum of money, contributed towards elementary education by the Imperial Government, must be added the sums derived from voluntary subscriptions and the rates. Last year the former amounted to 845,000*l.*, and the latter to 2,325,801*l.* There is no reason to believe that in the coming year these sums will substantially decrease; therefore it may be assumed that in the coming financial year a total sum of no less than 11,690,762*l.* will be spent by England and Wales upon elementary education.

THE annual Commencement at Columbia University on June 8 was noteworthy as the first to be held in the new and permanent home of the University on Morningside Heights. The number of degrees conferred was greater than on any previous occasion, amounting to 485 in cause, and four honorary. An unusual feature was the presentation of the Loubat prizes for the best works on the history, geography, archaeology, ethnology or numismatics of North America. These prizes, amounting to 1000 dollars for the first and 400 dollars for the second, are to be awarded every five years, beginning with the present year; and are not to be less than the amounts named, but may hereafter exceed those amounts. The first prize was awarded to William Henry Holmes, for his book

on "Stone Implements of the Potomac-Chesapeake Tide-water Provinces." The second prize was awarded to Dr. Franz Boas, for his work on "The Social Organisation and Secret Societies of the Kwakiutl Indians." Honourable mention was made of work by Dr. Carl Lumholtz, Mr. Frank H. Cushing, and Mr. Walter Hoffman, of America; and Mr. Alfred P. Maudslay, of London.

SCIENTIFIC SERIALS.

American Journal of Science, June.—A theory to explain the stratification of the electric discharge in Geissler tubes, by H. V. Gill, S.J. The phenomenon of stratification is a form of Kundt's experiment in which the heaps of powder which accumulate at the nodes are replaced by the strata of molecules between which the discharge is taking place in a luminous form.—Orthoclase as a gangue mineral in a fissure vein, by Waldemar Lindgren. During the examination of Silver City mining district, in southern Idaho, a vein was encountered containing a gangue of unusual character, consisting of quartz and orthoclase, the latter sometimes preponderating. It occurs as large, irregular milk-white grains, intergrown with vein quartz. This occurrence, together with various other forms, demonstrates the aqueous origin of the mineral. The analysis indicates typical adularia. The artificial production of orthoclase in the wet way, by heating powdered muscovite with a solution of potassium silicate, has a direct bearing upon its natural occurrence. The reason why orthoclase is not more frequently found on mineral veins lies possibly in the abundant presence of carbon dioxide in thermal waters, which would rapidly attack orthoclase and form more stable compounds, such as muscovite or sericite.—Notes on rocks and minerals from California, by H. W. Turner. The rocks discussed include a peculiar quartz-amphibolite-diorite, a new amphibole-pyroxene rock, a quartz-alunite rock, gold ores containing tellurium, selenium, and nickel, and gravels containing zircons.—A psychrometer applicable to the study of transpiration, by Robert G. Leavitt. The psychrometer consists of four nickel-plated tubes which can be kept at various temperatures by a mixture of hot and cold water. The dew point is indicated immediately by noting which of the tubes bears a deposit, and by varying the temperatures within narrow limits it may be found within 0.1°C . The apparatus was employed to determine the effect of light on the transpiration of plants, and a decided fall of the dew point was noticed as accompanying a diminution of light.—Comments on *Bulletin* No. 21, "Solar and terrestrial magnetism in their relations to meteorology," by F. H. Bigelow. The *Bulletin* attempts to overthrow two positions held in terrestrial magnetism: (1) that the sun is not a magnetic body because it is too hot, and (2) that the variations of the terrestrial magnetic field can be accounted for by electric currents in the cirrus cloud region. The earth is immersed in an external magnetic field of such a direction and strength as to make the inference necessary that its seat is in the sun. Else it will be necessary to assert that the earth's changes are sufficiently strong to disturb the sun's state, which is absurd.

Bulletin of the American Mathematical Society, May.—Concise abstracts are given of nine papers read at the third regular meeting of the Chicago Section of the Society, held on April 9. At the afternoon meeting Prof. Michelson exhibited the workings of his new harmonic analyser, a description of which was published in the *Philosophical Magazine* for January 1898.—Prof. M. Böcher finishes his paper on the theorems of oscillation of Sturm and Klein. In the present portion Prof. Böcher proves two simple theorems of Sturm's, and uses these to throw Sturm's theorem of oscillation into a slightly generalised form; he then proves Klein's theorem in a very general form. He proposes, in a subsequent paper, to come back to some more general cases which do not seem to present any serious difficulty.—The construction of special regular reticulations on a closed surface, by Prof. H. S. White, was read, in part, at the January 1897 meeting of the Society, and in final form at the recent April (30) meeting. The reticulations here discussed are called regular for two reasons: the number of termini of edges (r) assembled in one vertex is the same for all vertices (V) of the reticulation, and the number of edges (s) in the boundary of a face (F) is the same for all faces. The writer remarks that the regularity of these reticulations is not the same as that defined by Dyck and Klein in function-theoretic investigations; the two definitions overlap, but neither includes the other.

The points discussed are (1) the mutual derivations of two dual reticulations from each other (dual when r, s, V, F of the first are equal respectively to s', r', F', V' of the second, and when each face of the one corresponds to a vertex of the other in such a way that the succession of vertices about each face corresponds exactly to the succession of faces about the corresponding vertex). (2) Two processes for multiplying the number of vertices or faces; and (3) the dissection of a Riemann surface into a fundamental polygon.—Dr. L. E. Dickson, in systems of simple groups derived from the orthogonal group, continues previous work (*Bulletin*, February number).—A

proof of the theorem $\frac{d^2u}{dx dy} = \frac{d^2u}{dy dx}$ follows, by Mr. J. K.

Whittemore (read at the April meeting). This is short and neat.—Miss Frances Hardcastle contributes an interesting article entitled, "Some observations on the modern theory of point groups," in which she indicates some of the converging lines of the German and Italian work. In her first section she discusses some of the technical terms, and in the second section she starts from the Riemann-Roch equations by the suggestion of certain lines of inquiry which may prove useful in the classification of algebraic curves. A useful bibliography is appended.—A note on contact transformations is intended, by Prof. E. O. Lovett, to correct some misapprehensions that a reader of a note in the *Zeitschrift für Mathematik und Physik* (vol. xxxvii., 1892) to a paper by Dr. Mehmke may carry away.—Dr. Staude's "die Focaleigenschaften der Flächung zweiter ordnung" is reviewed; and Mr. J. E. Campbell, in a note, admits the validity of an objection brought by Prof. E. O. Lovett (in the November 1897 *Bulletin*) against a statement in his paper (*Proc. L.M.S.*, vol. xxviii.—incorrectly xxiii. in the *Bulletin*—pp. 381–390), and expresses his meaning more clearly.—"Notes" and "publications" close the number.

Wiedemann's Annalen der Physik und Chemie, No. 5.—Susceptibility of water and aqueous solutions, by H. du Bois. Determinations of the molecular susceptibilities of the salts of some paramagnetic metals, such as the chlorides of Ce, Cu, Ni, Fe, and Mn, go to confirm the rule observed by Jäger and Meyer that the atomic susceptibilities of the metals Ni, Co, Fe, and Mn are in the ratios 2:4:5:6.—Magnetic after-effect, by C. Fromme. The "magnetic creeping" or after-effect diminishes when the reduction of the field to zero takes place rapidly. This may be explained by supposing that the molecular magnets are thereby thrown into a more violent commotion, and are better able to attain stable positions. A similar effect may be brought about by heat or mechanical stress.—Magnetisation of hollow and solid iron rings, by F. Kirstädter. To determine whether the outer parts of a rod or ring screened the inner portions against magnetisation, the author split a ring in two halves, and bored round holes so that on recombination a hollow ring was formed. By boring the holes larger and larger the surface of the ring was given various thicknesses. It was found that the inner layers acquired the same magnetisation as they would have done had they been exposed to the immediate action of the magnetising field.—The function of the condenser in an induction apparatus, by P. Dubois. There is a certain maximum spark length obtainable in any given induction coil circuit by means of a condenser. When the capacity of the condenser exceeds that maximum, the effect diminishes. For a resistance of some 200 ohms in the circuit, the maximum useful capacity for the condenser is 3 microfarads.—On the rays proceeding from thorium compounds and some other substances, by G. C. Schmidt. These rays differ from uranium rays in not being polarised by tourmaline, and from Röntgen rays in being refracted. But like uranium and Röntgen rays, they impart a temporary conductivity to air and other gases.—Potential gradients at electrodes discharged by X-rays, by C. D. Child. When the discharge passes between two plates with air between rendered conducting by means of X-rays, the gradient is steeper near the plates and less steep in the middle, as may be proved by a Kelvin water-dropping electrometer.—Proof of the existence of the thin Zenker's plates in colour photographs taken by Lippmann's method, by R. Neuhaus. The layers of metallic silver to which, according to Zenker's theory, the colour effects in Lippmann's photographs are due, have been actually seen and photographed by the author under a microscope magnifying 4000 times in a cross section of a film taken by a very good microtome and operator. The distance between the lamellæ for red light is, as postulated, equal to the wave-length of the light.